METHOD AND DEVICE FOR GLASS NAIL FILES

CROSS REFERENCE TO RELATED APPLICATIONS

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BACKGROUND OF THE INVENTION

1. Field of the Invention

The instant invention relates generally to nail files, and more particularly, to glass and crystal nail files for use with finger nails and toe nails and a process for making the same.

2. Description of the Background Art

Nail files are known in the art and typically comprise a cardboard-like material covered with powdered emery to create a rough filing surface. The emery creates a rough surface for filing down nails when repeatedly brushed across the nails. Nail files have also been made from other types of emery boards and ceramic materials. The problem with conventional nail files known in the art is that they tend to easily break or lack sufficient durability for long time use. The emery surface normally lacks uniform roughness and becomes smooth after repeated use. In addition, known nail files are typically opaque such

that the nail is concealed from view when filing. Moreover, nail files known in the art tend to be rather plain in appearance. Consequently, a more durable, attractive, and at least partially translucent nail file would be well received. The instant invention addresses this need by providing a glass nail file and a chemical process for making glass nail files in accordance with the invention.

BRIEF SUMMARY OF THE INVENTION

Based on the foregoing, it is a primary object of the instant invention to provide a durable, attractive nail file having virtually an infinite life.

It is also an object of the instant invention to provide a nail file that can be made from glass, crystal, glass-like material or crystal like material.

It is an additional object of the instant invention to provide a transparent and textured nail file that allows viewing of the person's nail during use.

It is a further object of the instant invention to provide a process for making glass nail files.

It is another object of the instant invention to provide a glass or crystal nail file that is hygienically safer than conventional.

It is still another object of the instant invention to provide a glass or crystal nail file that may used on domestic animals.

In light of these and other objects the instant invention comprises a glass nail file and process for making a glass nail file. The glass nail file of the instant invention may comprise glass or glass-like materials, such as crystalline materials, that are substantially transparent or partially translucent, at least prior to adding color or mirrored surfaces, and facilitate or

accommodate the process of the invention, including the ionic exchange process comprising the method of the invention as described herein. The glass nail file of the instant invention has at least one rough grinding surface and is preferably transparent and textured and durable enough for a lifetime of use. The preferred glass employed comprises a crystal like glass. The grinding surface comprises a uniformly fine yet rough surface that is formed in an initially smooth surface using chemical etching techniques. The grinding surface combines a reliable grinding ability with a relatively soft tool. An ionic exchange process with dissolved salts is used to create the grinding surface and increases the mechanical strength of the grinding surface. The nail file may also comprise a handle portion and sleeves for storing and protecting the nail file.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1A is a top perspective view of a first embodiment of the present invention.

FIG. 1B is a bottom perspective view of the first embodiment of the present invention.

FIG. 1C is a top elevational view of the first embodiment of the present invention.

FIG. 1D is a bottom elevational view of the first embodiment of the present invention.

FIG. 2 is a side elevational view of the embodiment shown in Fig. 1.

FIG. 3 is a perspective view of one embodiment of the protective sleeve of the present invention.

FIG. 4A is a top perspective view of a second embodiment of the present invention illustrating a handle.

FIG. 4B is a top perspective view of the second embodiment of the present invention illustrating a handle.

FIG. 4C is a front elevational view of the second embodiment of the present invention illustrating a handle.

FIG. 4D is a rear elevational view of the second embodiment of the present invention illustrating a handle.

FIG. 4E is a side elevational view of the second embodiment of the present invention illustrating a handle.

FIG. 5A is a top perspective view of a third embodiment of the present invention illustrating a pointed top end.

FIG. 5B is a front elevational view of the third embodiment of the present invention illustrating a pointed top end.

FIG. 5C is a rear elevational view of the third embodiment of the present invention illustrating a pointed top end.

FIG. 5D is a side elevational view of the third embodiment of the present invention illustrating a pointed top end.

FIG. 6A is a top perspective view of a fourth embodiment of the present invention illustrating a pointed top end and handle.

FIG. 6B is a bottom perspective view of the fourth embodiment of the present invention illustrating a pointed top end and handle.

FIG. 6C is a front elevational view of the fourth embodiment of the present invention illustrating a pointed top end and handle.

FIG. 6D is a rear elevational view of the fourth embodiment of the present invention illustrating a pointed top end and handle.

FIG. 6E is a side elevational view of the fourth embodiment of the present invention illustrating a pointed top end and handle.

FIG. 7 is a perspective view of a second embodiment of the protective sleeve of the present invention.

FIG. 8A is a front elevational view of the first and second embodiments of the glass nail file 10 of the instant invention illustrating a rounded contour on both the top and bottom ends.

FIG. 8B is a front elevational view of the third and fourth embodiments of the glass nail file 10 of the instant invention illustrating a top pointed end and a bottom rounded end.

FIG. 8C is a front elevational view of a fifth embodiment of the glass nail file 10 with a top pointed end and a flat bottom end.

FIG. 8D is a front elevational view of a sixth embodiment of the glass nail file 10 of the instant invention illustrating a tear drop shape wherein the nail file tapers from a rounded, bottom end to a smaller rounded top end.

FIG. 8E is a front elevational view of a seventh embodiment of the glass nail file 10 illustrating a rectangular shape with no rounded ends.

FIG. 8F is an elevational view of an eighth embodiment of the glass nail file 10 of the instant invention illustrating a pointed top end and rounded bottom end having a larger radius of curvature than the embodiments shown in FIGS. 8B and 8D..

FIG. 9 is a front elevational view of a ninth embodiment of the glass nail file of the instant invention illustrating a handle defined by a smaller width in one section compared to a wider width defined by the nail filing section.

FIG. 10 is a front elevational view of a tenth embodiment of the glass nail file of the instant invention illustrating a nail filing section having a grinding surface that is smaller than the nail filing section.

FIG. 11 is a front elevational view of an eleventh embodiment of the glass nail file of the instant invention illustrating an exterior handle affixed to one end of the nail file.

FIG. 12 is a front elevational view of the eleventh embodiment of the glass nail file of the instant invention illustrating the exterior handle affixed to one end of the nail file and a corresponding removable top sleeve.

FIG. 13 is a flow diagram of the process of making the glass nail of the instant invention.

DETAILED DESCRIPTION OF THE INVENTION

With reference to the drawings, FIGS. 1-13 depict the preferred embodiments of the instant invention of the glass nail file device, which is generally characterized as a glass nail file and/or by reference numeral 10. The instant invention also comprises the process of making the glass nail file 10. Referring to the drawings, and with particular reference to FIGS. 1A-2, the glass nail file 10 comprises an oblong glass or glass-like substrate that is amenable to the chemical hardening and etching process (ionic exchange process), thermal hardening process, and mechanical roughening process of the instant invention. The process selected for creating the roughened surface 12 depends on the desired finish trying to be

achieved. For instance, to achieve a softer roughened surface, such as approximately 10μm, a chemical ionic exchange process can used, as further described herein. To achieve a higher degree of roughness, such as 100 μm, a mechanical process, such as sandblasting, may be used.

The nail file 10 comprises a top end 11, bottom end 13 , and at least one surface or portion of a surface 12 having a non-granular rough grinding medium that is formed by the unique processes of the instant invention. The nail file substrate 10 is preferably made of flat molded glass and has at least one roughened grinding surface. The nail file 10 is preferably translucent or at least partially translucent to allow a user to see the nail while filing. With reference to FIGS. 1A-2 and 4A-6E, the glass nail file 10 preferably includes a smooth surface 14 on one side and a grinding surface on the opposite side. In another embodiment, the glass nail file 10 may comprise rough/grinding surfaces on both surfaces 12, 14 formed in accordance with the teachings of the invention. In the second and fourth embodiments, the nail file 10 may have a handle 16 formed by a smooth section on one or both surfaces 12, 14 located proximal one end, as shown in FIGS. 4A-4E and 6A-6E.

The preferred and alternative embodiments of the glass nail file 10 can be developed with the entire first surface 12 being rough or only a portion of the surface having a rough finish wherein the remaining section defines the smooth handle surface 16. In another embodiment, at least one side edge may be beveled into a tapered edge to provide another working surface. Both side edges may also be beveled and may converge into a point, as shown in Figs. 5 and 6. An additional embodiment of the invention, at least one side edge or end edge 11 and, or 13 may have a rough finish.

Referring to FIG. 3, the instant invention may further include a protective sleeve 20 having a nail file receiving and storage passage 24 and access opening 22 proximal the sleeve's top end 26 for use in storing and protecting the glass nail file 10. The protective sleeve 20 preferably comprises a soft material such as velour, felt, vinyl, or leather. The sleeve 20 is closed along the sides and bottom end 28.

The glass nail file 10 may comprise various shapes with and without handles. With reference to FIGS. 5A to 6E, the glass nail file's 10 the third and fourth embodiments have a pointed top ends, but only the fourth embodiment has a handle section 16. In a fifth embodiment, the first surface 12 and/or second surface 14 may comprise a reflective or mirrored surface. In a sixth embodiment, the first surface 12 and/or second surface 14 may comprise a predetermined color or colors for added aesthetic appeal. In a seventh embodiment, the first and/or second surface 12, 14 may include glass etchings or prints of various logos or designs, such as flowers, plants, butterflies and others, as further described herein.

With reference to FIGS. 8A-8F, the glass nail file 10 of the instant invention may include various designs and shapes, including pointed, round, oval, rectangular and combinations thereof. Referring to FIGS 1A to 4E and 8A, the glass nail file 10 may comprise rounded ends on the top 11 and bottom 13 ends. With reference to FIGS. 5A to 6E and 8B the glass nail file 10 may have a pointed top end 11 and a rounded bottom end 13. In FIG.8C, the glass nail file 10 is shown with a pointed top end 11 and a flat or rectangular bottom end 13. Referring to FIG. 8D, the glass nail file 10 may have an oval shape with both ends 11, 13 being rounded, wherein the top end 11 has a radius of curvature that is

smaller than the radius of curvature of the bottom end 13 such that the glass nail file 10 tapers inward from the bottom end 13 to the top end 11. With reference to FIG. 8E, the glass nail file 10 may have a rectangular shape with no rounded ends. Referring to FIG. 8F, the glass nail file 10 may have a pointed top end 11 and a slightly rounded bottom end 13 having a radius of curvature that is larger than that of the other bottom ends 13.

Referring to FIGS. 9 and 10, the nail glass file 10 may have a paddle shape wherein the nail filing section 15 is wider than the handle 16. The nail filing section 15 may have a rough grinding surface 12 corresponding to the shape of the nail filing section 15, as shown in FIG. 9. Alternatively, the grinding surface 12 may comprise a smaller area than that provided by the nail filing section 15 and may comprise an individual component attached or affixed to the nail filing section 15. With reference to FIGS. 11 and 12, the glass nail file 10 may include a removable or permanent grip 30 made of a rigid, durable material such as plastic, wood, or metal. A protective sleeve 32 may be included to cover the whole surface of the glass file 10 above the grip 30. The grip 30 and sleeve 32 preferably have corresponding shapes that mate.

The glass nail file 10 comprises a hard durable glass like or crystal like material that has a nail filing surface 12 that never or virtually never erodes or otherwise becomes smooth. The preferred embodiment of glass nail file 10 provides structure for tearing, grounding and forming natural and artificial nails. For artificial nail treatment, the glass nail file 10 should be soaked in water during its application onto the artificial nail. In addition to nail treatment, the glass nail file 10 may be used for removing hardened skin around the nail. The glass nail file 10 may also be used for treating hardened feet or callous skin. In such a case, after

removing the stiff layer of hardened skin by a suitable tool, the glass nail file 10 is then used to scrub the skin smooth. The larger embodiment of glass nail file 10 is recommended for this type of treatment. In an alternative use of the glass nail file 10, it may be used for grinding domestic animal claws. In yet another embodiment of the present invention the glass nail file 10 may be its use as a soft filing instrument of wooden or plastic material rims, particularly in the area of modeling.

The glass nail file 10 of the instant invention facilitates safer personal hygiene. The glass nail file 10 material is not porous or less porous than conventional paper based files, which reduces and/or virtually eliminates the absorption of water or fluids that could pose health risks, especially if they contain bacterial or mold germs. The glass nail file 10 also reduces and can eliminate fraying while filing nails. The process of the instant invention 10 also produces a mail file 10 having increased firmness and hardness, such that it has a high resistance to breaking when dropped.

The glass nail file 10 is designed to never corrode or erode under normal conditions. The rough finished surface 12 is not compromised by repeated use because of the durability of the glass product used and the method of manufacturing employed. The glass nail file 10 is preferably disinfected by boiling or sterilizing the nail file 10 in sterilization autoclaves. The convenience of sterilization offered by the invention is especially beneficial for professional applications to reduce the risk of passing infections between customers. The glass nail file 10 has a material that increases its strength by the ionic exchange of the glass-creating component, thus preventing the breakage of the glass nail file 10 during normal

applications. The glass nail file 10 is also durable enough to avoid breakage if occasionally dropped on floor coverings that can absorb impact forces, such as carpet and linoleum.

During normal application for nail treatment, the operating life of the glass nail file 10 is practically unlimited due to the inherent characteristics of the materials and process used. The glass nail file 10 has a hardness and shapes that increase safety and reduce rate of injury during normal use. For instance, the nail file 10 may comprise a smooth surface 14 opposite the grinding surface 12 to protect the technician. The nail file 10 may also be devoid of sharp edges. Proper maintenance of the glass nail file 10 includes washing it under running water. Proper maintenance may be required to keep the nail file 10 sanitary and in conformity with governing health standards. A detergent and a brush can be used to clean the glass nail file 10 to remove dirt, debris and stains. To remove other types of debris such as varnish and or smear creams from the glass nail file 10, any organic cleaning or solvent agent known in the art may be used.

The glass nail file 10 preferably has dimensions of approximately 120-200 mm (millimeters) in length, 10-25 mm in width, and 1-4 mm in thickness. The dimensions of the glass nail file 10 may vary according to the task to be performed. For instance, professional manicurists may prefer a glass nail file 10 with a length of approximately 195 mm, a width of approximately 18 mm, and a thickness of approximately 3 mm. The nail file 10 may also include a smooth handle surface 16 or a smooth non-grinding surface 14, as previously discussed herein. The one-sided smooth finish embodiment of the glass nail file 10 may assist a manicurist in preventing the finger skin of the manicurist from being scraped during use. A glass nail file 10 with a length of 195 mm, width of 22 mm, and a thickness of 4 mm

may be utilized for hardened skin treatment. It should be noted that the length and width disclosed herein may vary without departing from the scope and spirit of the invention.

Various logos or decoration techniques including coloring and etching may be incorporated into the glass nail file 10 design, as shown in FIGS. 4A and 4B. The logos and designs on the glass nail file 10 may be produced by printing, painting, sand blasting, grinding or engraving. Coloring may be done on the whole or partial surface or deep within the surface. Coloring may also be included in a frame or with a continuous, gradual change of color or in intensity as it descends into the rough and, or smooth surfaces 12, 14 of the glass nail file 10. All basic and supplementary colors may be used as well as their shades. The colored surface may be of one color, or a combination of two or more colors that may be transparent or non-transparent. When using the above techniques, various combinations of each can be used, such as coloring combined with sandblasting, or coloring combined with grinding. Another possible embodiment of the present invention is the production of the glass nail file 10 from colored glass that is transparent, non-transparent, or laminated from various colors.

A reflective layer or a mirror surface may be created over part of or the whole surface of the glass nail file 10. This can be accomplished in the natural color of the elements creating the mirror surface. Alternatively, various colored varnishes may be used to create, cover or enhance a mirrored surface. A silver mirror can also be treated with some transparent varnish in order to protect the reflective layer. See steps 112 to 114.

The nail file 10 comprises at least one roughened surface 12 and, or 14. The roughness of the selected surface(s) preferably comprises a roughness rating equal to or

greater than approximately 7 μm. The functional surface of the nail file 10 is preferably made chemically by a surface system of round deepenings of various diameters and depths. The roughness of the grinding surface 12 or any grinding surface on the nail file may vary lengthwise and comprise approximately 8.00 to 8.38 μm, 7.61 to 7.81 μm, 10.42 to 11.32 μm, and 11.02 to 11.63 μm.

With reference to FIG. 13, the method of creating glass nail files 10 comprises forming a flat, molded nail file substrate 10 of the approximate desired dimensions and shapes (104, 104A) and creating a grinding surface 12 by chemically etching or grinding at least one glass surface 12 and, or 14, in a manner that results in an equal and uniformly fine surface of consistent roughness without any scattered bosses or protuberant projections (110). One of the initial steps may include grinding or molding the nail file shape. After forming or grinding the nail file shape, a hardening or curing process follows for a predetermined period of time to increase the rigidity and durability of the glass nail file 10 (111). The hardening process employed may comprise a thermal/heat hardening process or a chemical process. A chemical roughing process may be used to reach a softer roughening, e.g.10 μm. A mechanical roughing process, such as sandblasting, may be employed to achieve a higher degree of roughness, e.g. 100 μm.

A technique that may be employed for hardening the nail file 10 comprises thermal hardening, where the glass is heated at at least one predetermined temperature or temperature range and then intensively cooled at a lower predetermined temperature. The thermal hardening process comprises heating the glass substrate 10 at a predetermined temperature Tg (transformation temperature, dilatometric transformation point, minimal dilatometric

curve, vitrescence temperature). The temperature selected varies in relation to the speed of warming and the glass type and comprises a range between 400 and 850 °C (750 °F and 1562 °F). The warming may be done in a gas or electric furnace. The furnace used may have one chamber or a continuous tunnel-like chamber. After reaching the Tg temperature, a quick cooling of the nail file substrate 10 follows. The cooling can be done by means of blowing a large amount of fast flowing air on the substrate 10 or by dipping the substrate 10 into a cooling liquid or spraying with a cooling liquid. The preferred cooling liquid comprises either an organic one, such as mineral oils or greases, waxes, silicone oils, liquid organic compounds (e.g. CCL_4 or higher alcohols), inorganic substances (e.g. melted salts or metals with a low melting point) or mixtures thereof. The cooling solution may also comprises solutions of salts. The substrate 10 may also be cooled laying it on a metal board and blowing air on it.

The chemical hardening process comprises an ionic exchange method in a hardening solution wherein a there is a diffusive exchange of ions from the surface layer of the glass and the ions from the hardening solution. The hardening solution comprises a bath of ions having a larger radius than the glass surface ions at a temperature below the cooling temperature. Hardening above the cooling temperature is not preferred because it can cause softening of the glass substrate causing the files to lose their shape or abrasive quality. During the chemical hardening a reciprocal ion exchange of Li^+; Na^+; Cu^+; Rb^+; Ag^+; and, or Cs^+ between the glass substrate and the hardening bath solution occurs. The ions exchanged depend on the type of the hardening solution used and the chemical make-up of the glass, such as borosilicate, sodiumaluminosilicate, plumbous, lithium-aluminosilicate,

sodium-zircosilicate and lime. The instant invention preferably uses a lime or lime-based glass for the nail file substrate 10. This results in an ionic exchange of sodium ($Na^{+)}$ ions from the glass nail file 10 with ions from the hardening bath solution. The hardening bath solution preferably comprises molten KNO_3 (potassium nitrate). The hardening itself is done by dipping the nail file 10 into the molten KNO_3 solution. The bath temperature is preferably 300-500 °C (572 to 932 °F). The dipping period is preferably between 1 and 30 hours, depending on the temperature and glass substrate. The nail files 10 are dipped into the molten KNO_3 in boxes made of wire braid or other anticorrosive steal. The files 10 are preferably separately fixed in the boxes so the hardening bath has access to the files 10 from all sides. The files are inserted upright into the opening of the box. The box may comprise multiple layers. After the dipping period, the box is taken out of the bath and allowed to drain. A slow cooling down period follows. After cooling the temperature down to approximately 100 °C (200 to 220 °F), the files 10 are rinsed in warm water and then washed and dried in an industrial washing machine.

The preferred technique for chemically etching the nail file 10 comprises creating an ionic exchange on at least one surface by soaking the glass nail file 10 in a solution comprising dissolved salts (110). In one embodiment, the solution includes hydrofluoric acid or other aqueous solution of hydrogen fluoride that chemically resembles hydrochloric acid but attacks silica and silicates for finishing and etching the glass substrate. The solution used causes an exchange of ions contained in the glass (e.g. Na) with ions released from the solution's dissolved salts or hydrofluoric acid (e.g. potassium -K) on the surface of the glass. The method of the instant invention produces a grinding face quality that ensures significant

grinding ability in a relatively soft surface. The mechanical strength and the practically unlimited operating-life of the grinding face is increased by the ionic exchange methodology in the last production phase. To create smooth surfaces or smooth sections in the glass nail file 10, the part of the glass nail file 10 that is intended to be smooth is protected from the acid action of the ionic exchange process (110). The glass nail file 10 may comprise at least one color, which may be added before or after forming the substrate and, or before or after the grinding process (112-114). Similarly, a mirrored surface may be created on at least one nail file surface by employing a reflective varnish or finish. Indicia may be added to the glass nail file substrate by sandblasting, etching, engraving or printing (116-118).

Since the grinding surface of the glass nail file 10 is achieved in accordance with the foregoing processes, the grinding surface 12 is neither loosened or lost during use. By contrast, the grinding surface is lost in conventional nail files through use when the abrasive grain making up the grinding surface is bound or applied to the surface of the substrate as opposed to comprising the substrate. With the glass nail file 10, such effect is impossible, and thus the stability of functioning without any loss of grinding abilities is achieved.

The instant invention has been shown and described herein in what is considered to be the most practical and preferred embodiment. It is recognized, however, that departures may be made therefrom within the scope of the invention and that obvious structural and/or functional modifications will occur to a person skilled in the art.